Deployment of a Robotic Work Platform for Hot Cell Deactivation (ASTD)

Deactivation and Decommissioning Focus Area

FY 2002 Mid-Year Review

March 5-7, 2002

Salt Lake City, UT

Department of Energy
Richland Operations Office

GT Berlin
River Corridor Project
Fluor Hanford

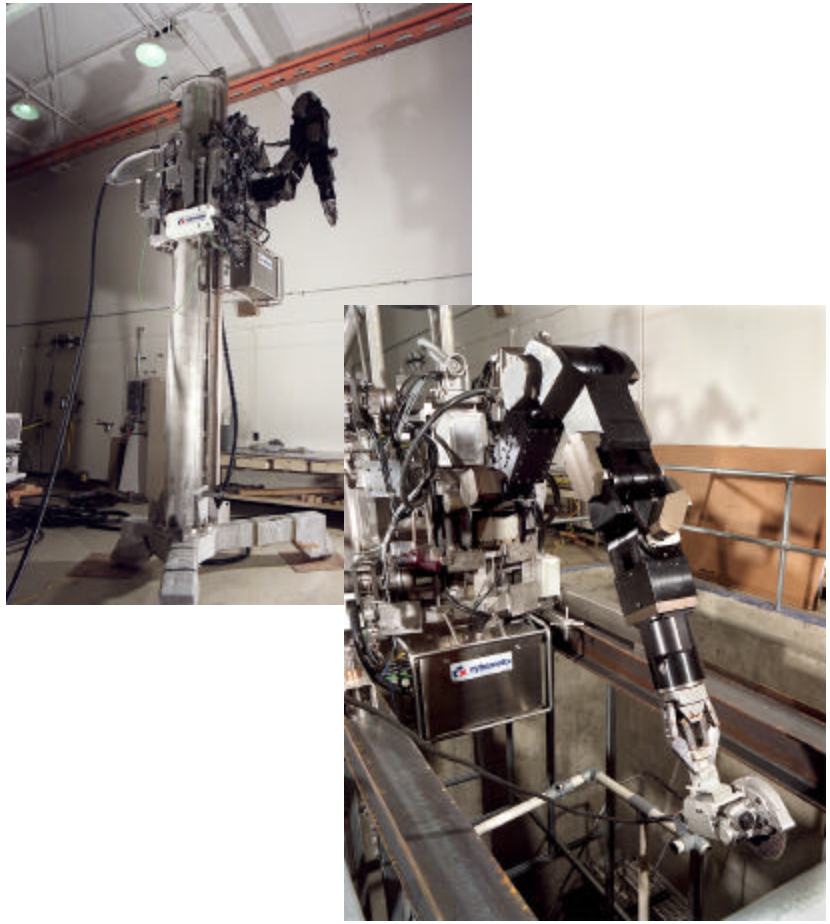
Project Goals and Technical Approach

- **Project Goals**: Enable characterization, decontamination, size reduction, and materials handling tools to be remotely deployed and effectively reach all spaces in 324 Building hot cells and support areas

- **Technical Approach**: Competitively procure and remotely deploy a robotic work platform that can perform a variety of deactivation tasks in a high dose environment

Maturity of Technology

- **Stage 6 – Demonstration**
  - Completed in 2001
- **Stage 7 – Deployment**
  - Initiated September 2001
  - Completed in January 2002
- **SAMM* Manipulators**
  - 11 manufactured to date
  - 6 active systems worldwide



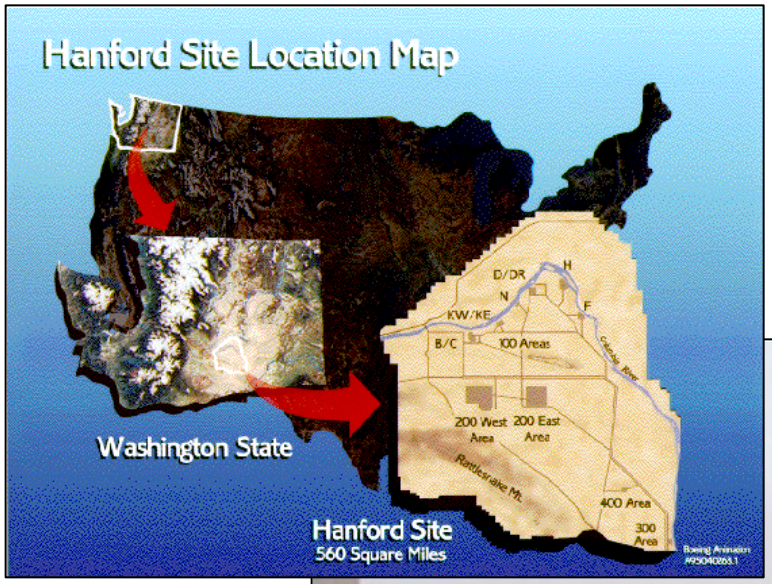
* Cybernetix and SAMM are trade names associated with Group Cybernetix of Marseille, France

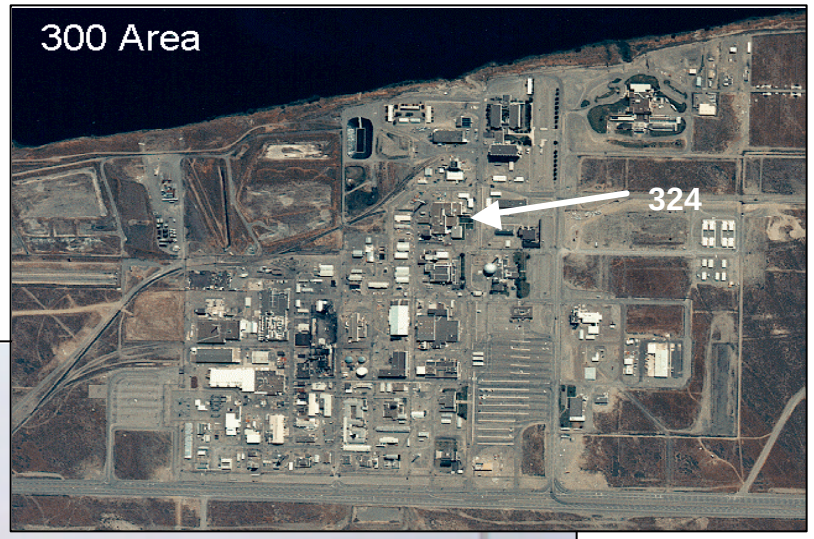
Relevance to Thrust Areas

- **Thrust Area 1 – Closure Site Support**
  - Supports Hanford's River Corridor Closure Contract (RCCC) Scope
    - Includes 324 Building D&D (per draft RFP)
  - Potential support to Rocky Flats

- **Thrust Area 2 – Alternatives to High Cost / Risk Baselines**
  - Improved capabilities over baseline equipment
    - Cranes and Manipulators
  - Supports up to seven Technology Needs at 324 Building

Hanford Site and 324 Facility Location

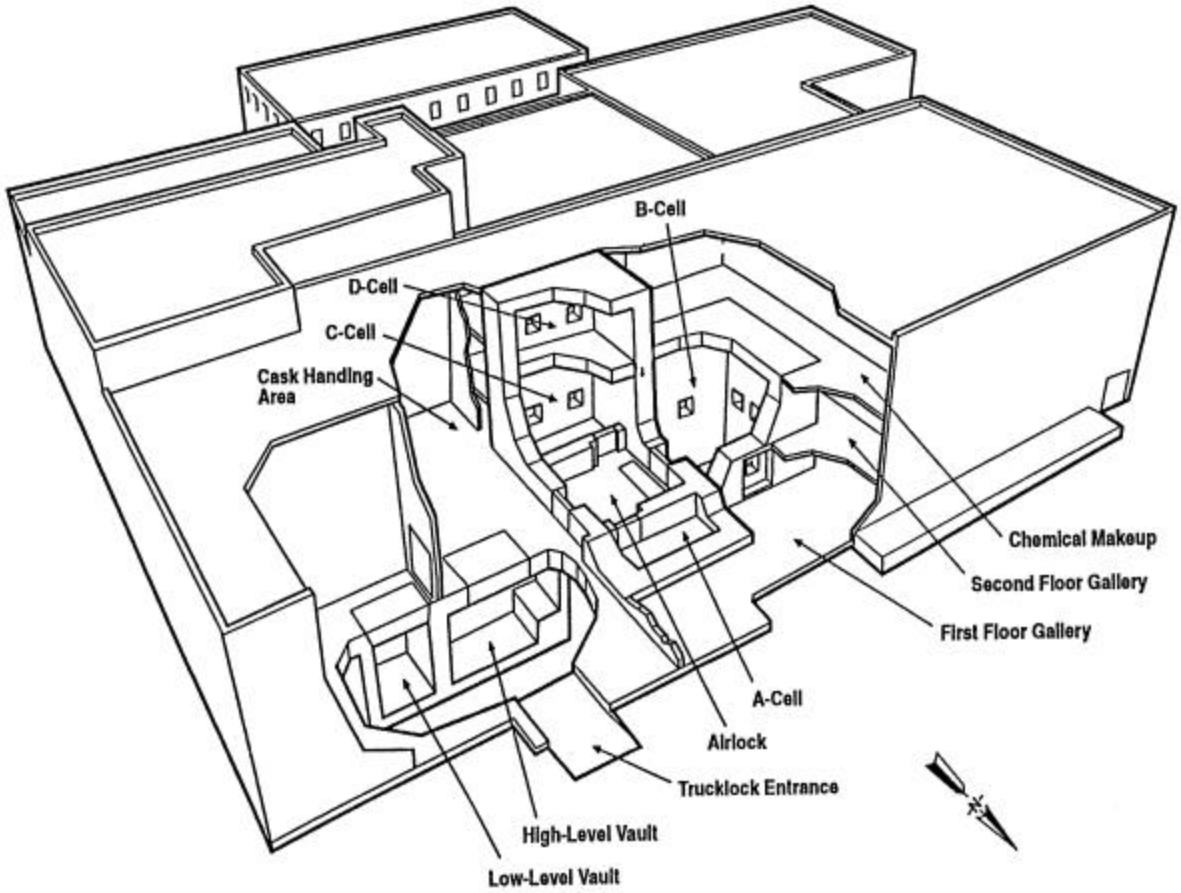




324 Building Background

- Previously known as Waste Technology Engineering Laboratory (constructed mid-1960's)
- Houses radiochemical and radiometallurgical hot cells and laboratories
- Supported multiple initiatives for DOE
  - high-level radioactive waste process development (vitrification)
  - destructive analysis of spent nuclear fuel
  - non-radioactive waste treatability studies
- Programmatically transferred from PNNL to Fluor Hanford in 1997 to initiate deactivation

324 Building
Radiochemical Engineering Cells (REC)



324 Building Challenges

- Highly contaminated environment
  - primarily Cs-137, Sr-90, traces of Am-241 and Cm-244
  - approximately 70M Curies through B-Cell alone
  - dose rates in B-Cell range from 200 - 2000 R/hr
- Difficult to reach all areas within cells
- Poor visibility
  - low lighting
  - limited viewing via windows, cameras, mirrors
- Baseline equipment was not designed for D&D work
  - overhead cranes experience significant down time
  - master slave manipulators have limited reach
  - requires multiple / specialized tooling for cranes and manipulators
    - costly planning, design, procurement, fabrication, mockup, training
- Accelerated D&D schedule

324 Building Technology Needs Supported by ASTD Project

Need No.	Title of Hanford STCG Technology Need
RL-DD010	*Radiation Hardened Robotics for Building 324*
RL-DD05	Characterization of Buildings 324 and 327
RL-DD06	Decontamination of Buildings 324 and 327
RL-DD08	Remote Cutting Technologies for Buildings 324/327
RL-DD09	Tank Remediation for Building 324
RL-DD011	Structural Integrity Inspection – 324/327 Buildings Hot Cell Liners
RL-DD047	Remote Viewing for Hot Cells in Buildings 324 and 327

Other Related Hanford Needs

Need No.	Title of Hanford STCG Technology Need
RL-DD02	Glovebox Size Reduction System at PFP
RL-MW03	Remotely Controlled Size/Volume Reduction Techniques for RH MLLW and RH TRUW
RL-MW04	Remote Decontamination of RH TRUW Debris to Support Reclassification into Non-TRUW Category
RL-MW016	System to Retrieve RH TRUW from Caissons
RL-WT021	Cleaning, Decontaminating and Upgrading Hanford Pits
RL-DD034	Remote/Robotic Technologies for CDI
RL-DD048	Volume Reduction of Equipment for CDI

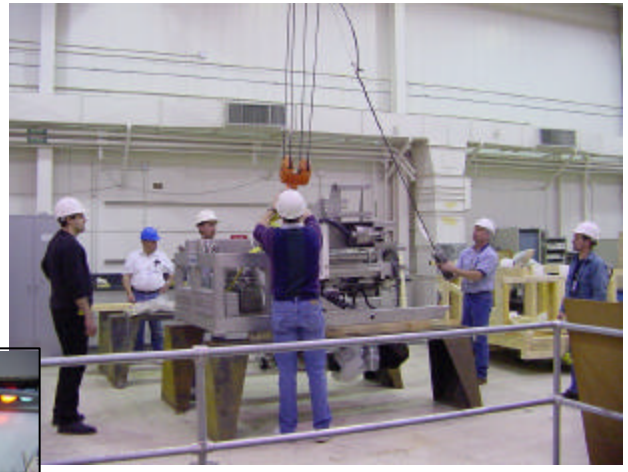
Other Sites' STCG Needs

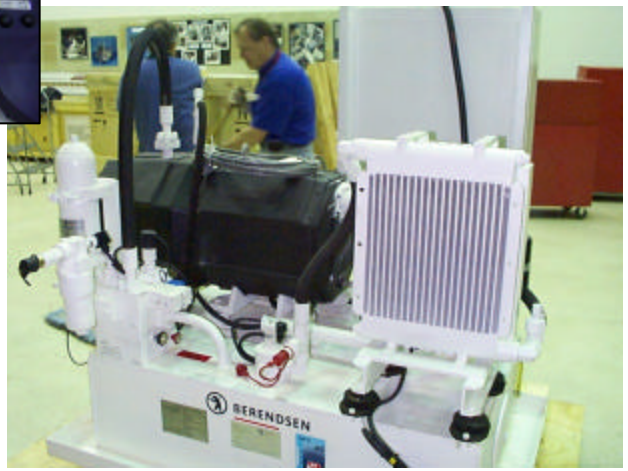
Need No.	Title of STCG Technology Need
AL-00-01-DD	Size Reduction Technology for TRU Mixed Waste
ID-7.2.08	Robotics for D&D
OH-WV-910	Size Reduction of Components
ORDD-06	Improved Remote Decontamination Methods
ORDD-07	Remote Dismantlement Methods
RF-DD11	Improved Size Reduction of Contaminated Equipment and Demolition Waste
SR00-1012	Capability for Remote Handled Size Reduction of TRU Mixed and Non-Mixed Waste
SR00-4001	Dismantlement of Large and/or Complex Equipment and Structures

Progress / Significant Accomplishments

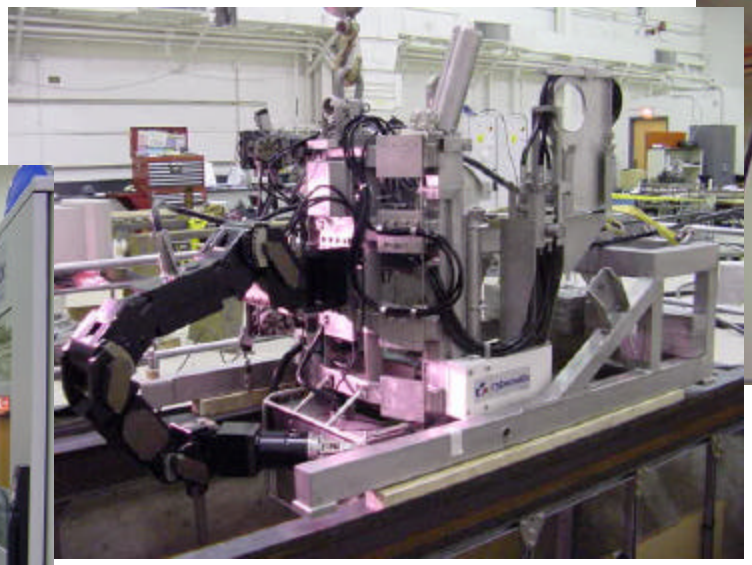
- Procurement
  - Awarded Contract 02-00
  - Completed System Fabrication Assembly and FAT (including UL Certification) 02-01
  - Received System and Completed SAT 03-01
- Pre-Deployment
  - Initiated Training of Ops and Support Staff 03-01
  - Completed Qualification of Operators 07-01
- Deployment
  - Initiated Deployment for Pipe Trench Cleanout 09-01
  - Completed Pipe Trench Scope 01-02
    - Deployment Fact Sheet (02/02)
    - Cost and Performance Report (due 3/02)

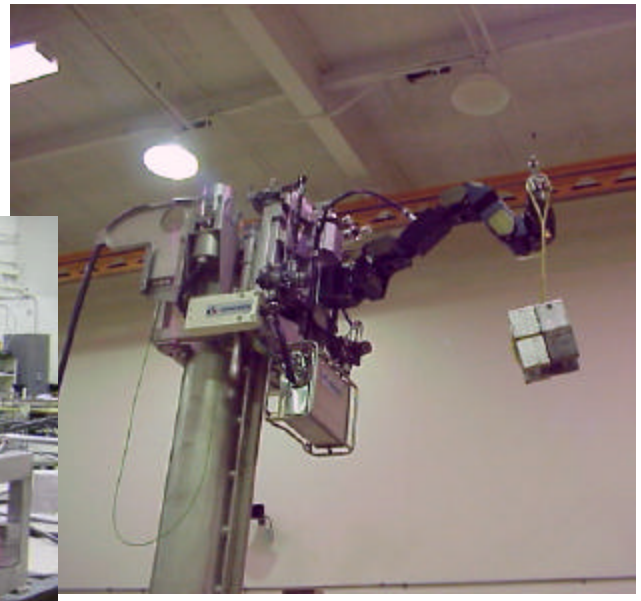
Robotic System Receipt and Assembly in Hanford's 306-E Facility (3/01)





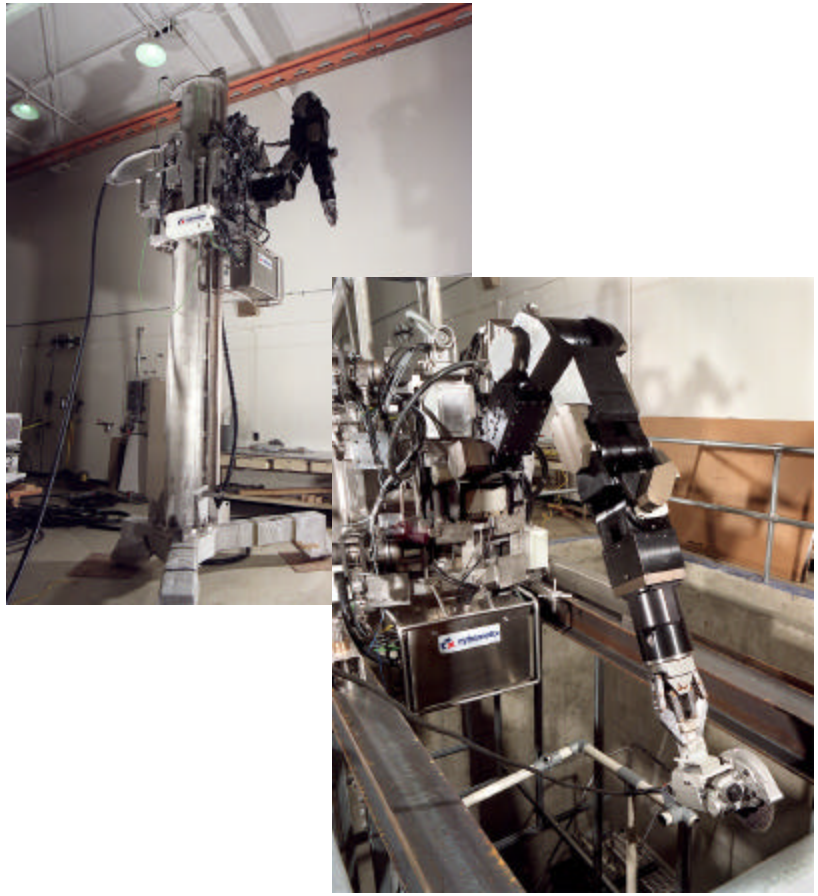
Hanford Site Acceptance Testing and Qualifications Training (3/01 – 7/01)





Configuration and Tooling Options

- Impact Wrenches
- Hydraulic Shears
- Grippers
- Circular and Reciprocating Saws
- Video Cameras / Lighting
- NDE Tools
- Pipe Cutters
- Plasma Arc Torch
- Decontamination Equipment
- Mechanical Grinders
- Scrapers / Shovels
- Others



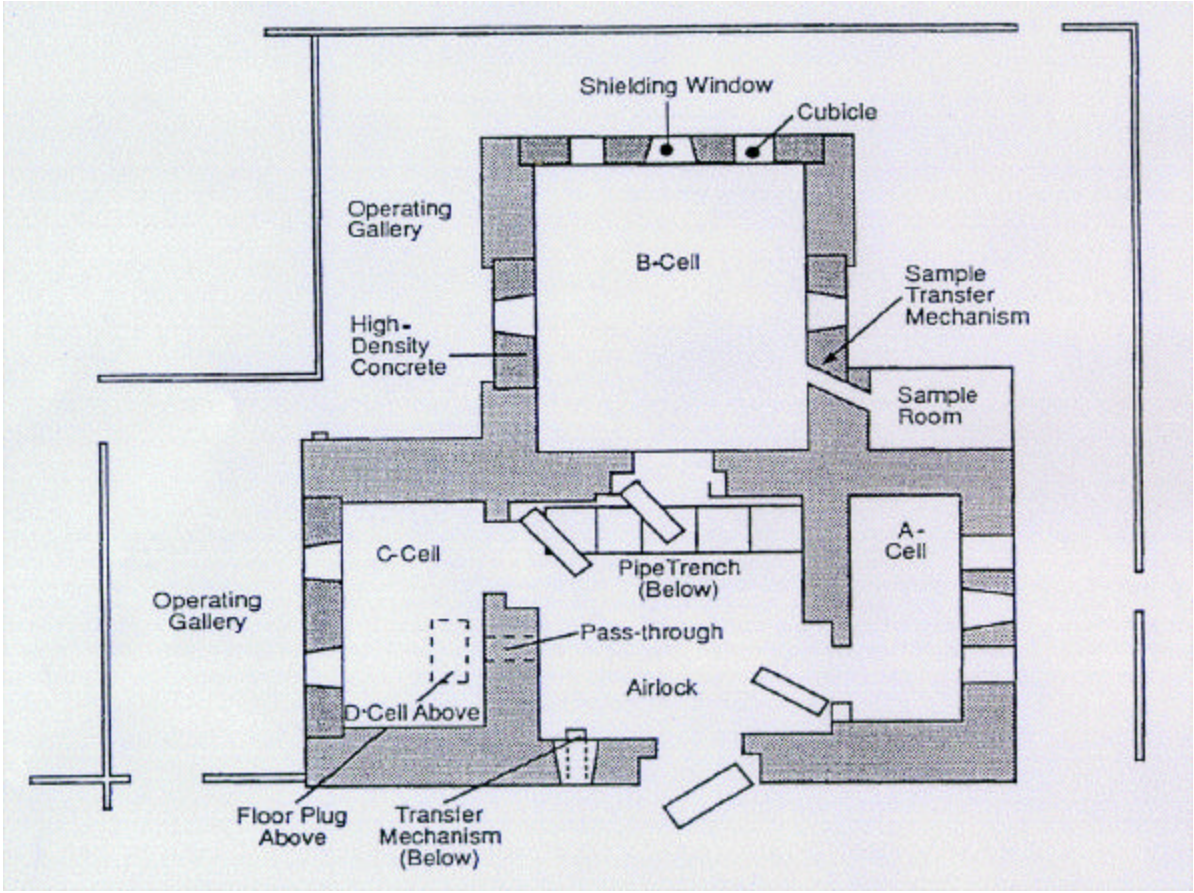
Benefits to Baseline

- Full reach capability to nearly all surfaces in hot cells
- Improved dexterity
- Greater payload than master slave manipulators
- Fewer custom-designed tools needed
- Reduced crane and MSM dependency/failures/repairs
- Efficiency gains for troubleshooting and repair of cranes
- Increased visual capability / control
- Dose reduction to workers (ALARA)
  - reduced need for airlock entries
- Cost Savings / Avoidance
  - estimated at over $3M for 324 Building hot cells and supporting areas

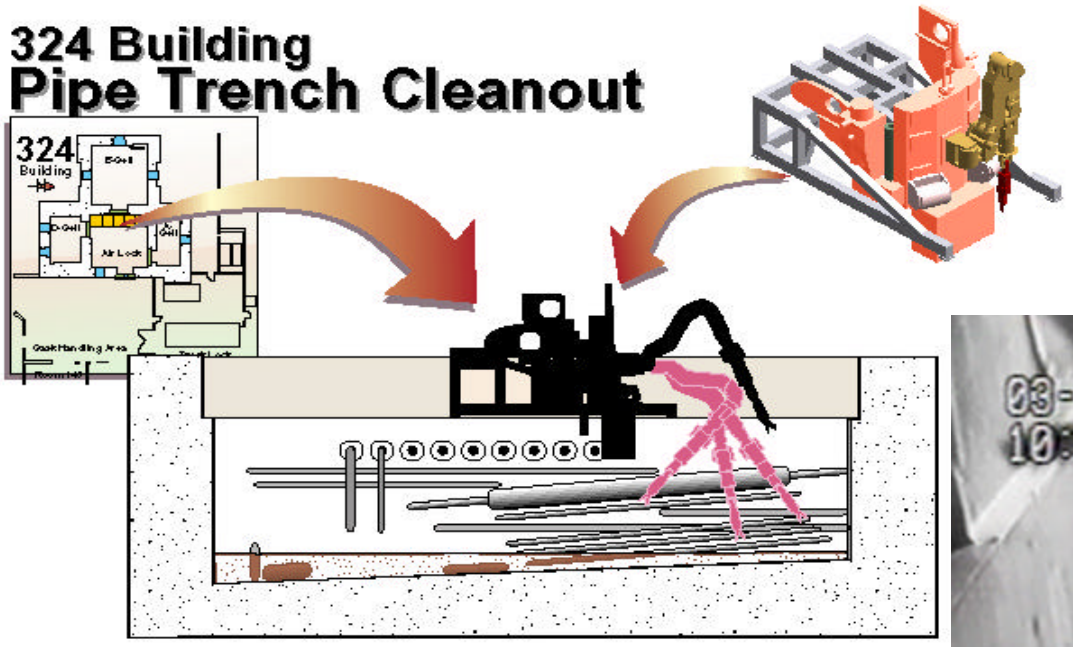
Deployment in 324 Building Pipe Trench

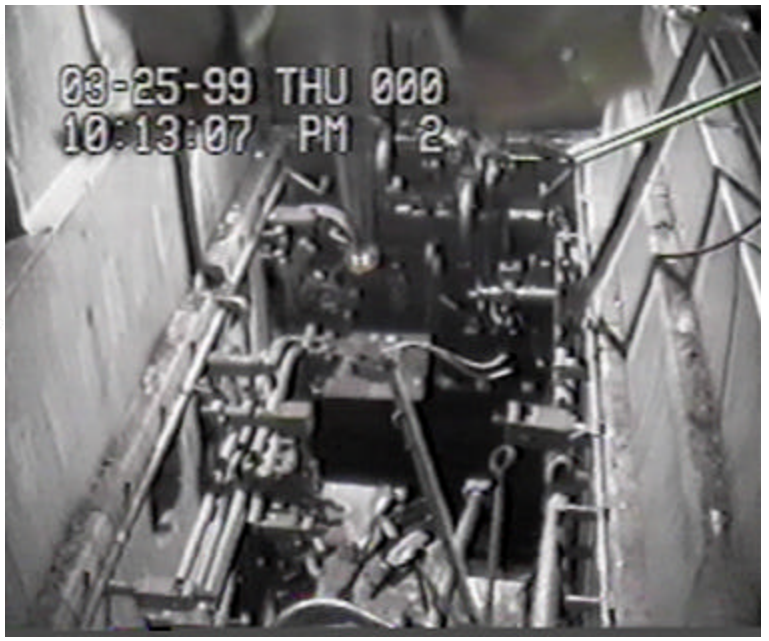
- Scope
  - Remove process piping, drip trays, block nozzles, pipe jumpers and other items, as necessary, to access and remove sediment-like residue from the bottom of the Pipe Trench
- Challenges
  - Low confidence in actual configuration of Pipe Trench internals
  - High dose (no manned entries while coverblocks removed)
  - Tight schedule (October 2001 to early January 2002)
    - REC needed by January 10 for SNF removal project

Plan View -- 324 Building Radiochemical Engineering Cells (REC)



Initial Deployment of Robotic System





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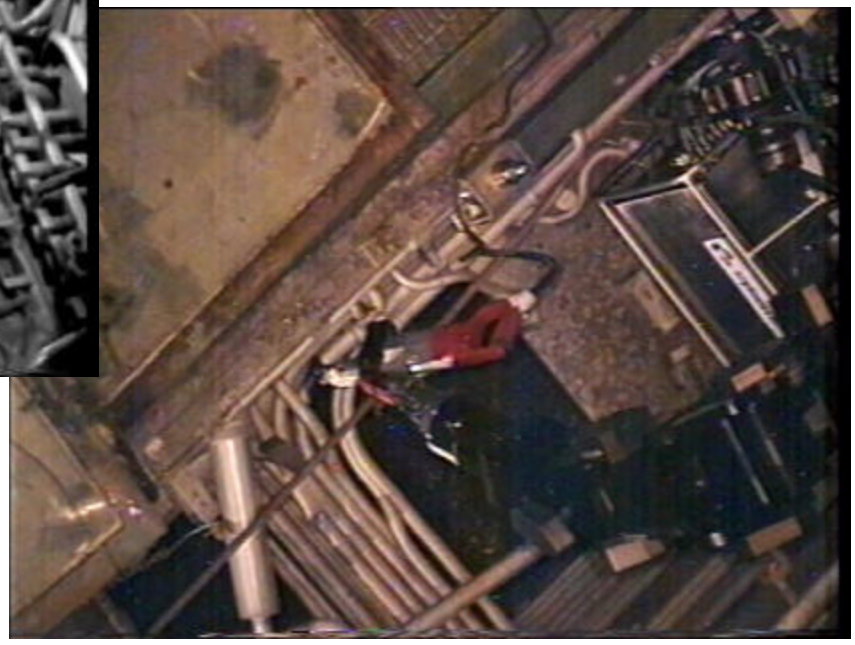

Deployment Results

- Results / Accomplishments
  - System found to be fully capable of all tasks needed (heavy duty to delicate)
  - Tight schedule could not have been met without the Cybernetix system
  - All baseline scope completed (including waste packaging and shipment)

- Lessons Learned
  - Selected and dedicated operations staff was key to success
  - 2-3 months of training was reasonable for system
  - Actual conditions more challenging than mock-up
    - Variability in pipe hardness, piping congestion, audio feedback
  - Additional camera coverage always useful
  - Hydraulic leak near axis #3 (upcoming repair)

Status of Scope, Schedule and Cost

- **Scope and Schedule**
  - TTP Milestone 5, Complete Installation of Robotic Work Platform in 324 for Deactivation Activities (due 09/30/02, completed 09/27/02)
  - TTP Deliverables: Deployment Fact Sheet (completed), Cost and Performance Report (in process)
- **Cost**
  - Jointly Funded EM40 / EM50
  - EM50 Budget of $1,545K
    - FY01 C/O = $862 (remaining funds deobligated)

Community / Stakeholder Activities

- Weekly
  - River Corridor Project Weekly Report (internal to Fluor Hanford)
  - River Corridor Project – Project Status Meeting with DOE-RL
- Monthly
  - Fluor Hanford's "Technology Management" Report
- Other
  - STCG Briefings
  - Lessons Learned Sharing with TFA / Robotics Crosscutting Staff
  - Local Newspapers (e.g., Hanford REACH, Tri-City Herald)
  - Presentation to WA-Ecology on 324 Building Robotics
  - Hanford SAFETY EXPO (upcoming, April 30 - May 2, 2002)

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